Making a Model Landfill

Every day, each person in Wisconsin throws away approximately 4.7 pounds of non-recyclable trash at home, school or at work. Where does it all go and what happens to it when it gets there? Where is "away?" In the United States, "away" means a sanitary landfill where garbage is buried in the ground. In Wisconsin, "away" is one of the 41 licensed landfills located throughout the state. Up until the 1970's, Wisconsin had over 2,000 garbage dumps and landfills. However, only a small percentage of these were state-of-the-art landfills—designed to prevent pollution problems. With new state and federal regulations, almost all of the older dumps, incinerators and landfills were closed. New sanitary landfills, are now built with clay and other liners to decrease the risk of polluting the environment.

This activity will help students understand what happens to their trash once it reaches a landfill. The students will become familiar with the term "leachate"—the liquid that has percolated through trash or been generated by the decomposition of trash in a landfill. This liquid carries dissolved or suspended materials that may contain toxic chemicals, which can contaminate ground and surface water. Leachate is one of the major problems associated with landfills.

Learning Objective: To have students think about where their garbage goes and to help them understand the problems associated with waste management.

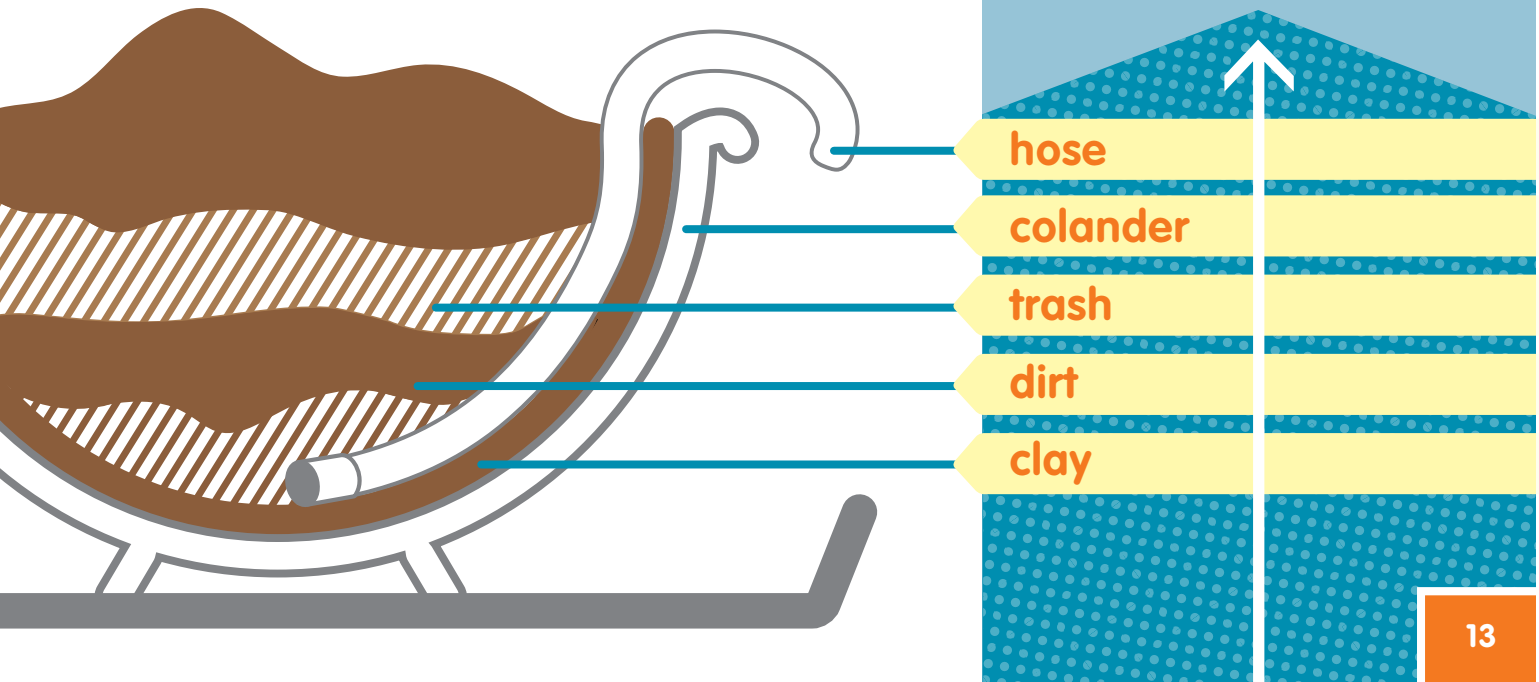
Subjects: Science, Environmental Education

Wisconsin Model Academic Standards: SC A.4.1, A.4.5, C.4.2, C.4.5, C.4.7, C.4.8, EE A.4.1, A.4.2, A.4.3, C.4.1, D.4.1

Grades: 2-3

Materials: 2 plastic colanders, 2 cake pans, 2 half gallon ice cream bucket of garden soil (1 for each colander), 3 feet of plastic aquarium hose, 1 rubber band, small piece of nylon stocking, small pieces of typical home-generated garbage *(see family letter)*, modeling clay, grass seed, colored crepe paper, paper and pencil

NEW SANITARY LANDFILLS ARE NOW BUILT WITH CLAY AND OTHER LINERS TO DECREASE THE RISK OF POLLUTING THE ENVIRONMENT.



EACH DAY, EVERY PERSON IN WISCONSIN THROWS AWAY APPROXIMATELY 4.7 POU

Procedure:

1. The day before you teach this lesson, ask your students to bring in five items their family throws away. Send a note (like the one at the end of this lesson plan) home with each student to remind her/him and to request adult assistance.

2. After completing "It's Your Trash" or a similar activity, ask your students the following questions:

- What happens to your trash after you throw it away?
- Where is "away?"
- Has anyone been to any of these "away places?"

Give them ample opportunity to share their ideas and experiences.

3. Tell students that most of the trash in Wisconsin ends up in landfills. Ask them: What happens to trash once it is buried in a landfill? After you discuss some of their answers, ask them to help you build two model landfills. One will be an old fashioned dump, and one will be a modern sanitary landfill.

4. To make your landfill: line one colander with flattened modeling clay. Pat out clay into a thin layer, like a pie crust. This represents the liner of a sanitary landfill. Do not line the second colander, it represents the old fashioned dump, where the policy was to dig a hole, dump in the trash, and cover it with dirt. Place cake pans under the colanders to collect the seepage or *leachate*.

5. Attach the piece of nylon stocking to one end of the plastic aquarium hose with a rubber band. Put this end in the bottom of the clay lined landfill. This will be your monitoring well. The leachate that collects at the bottom of the clay liner can be siphoned off and examined.

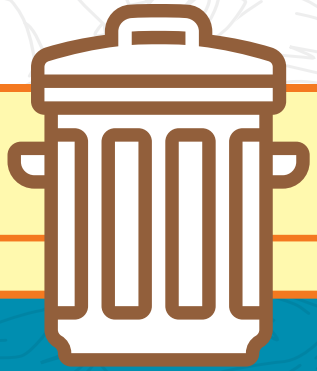
6. Have students cut each different garbage item into small pieces, about two inches square. You will have to cut or break metal, glass, or leather items.

7. Place trash and soil in colanders in alternating layers until they are filled. Keep a list of all the items placed in each landfill, or keep an example of each piece of trash. You may want to add a layer of colored crepe paper to represent toxic waste (the color bleeds out).

8. Build a small mound of dirt in each colander and plant grass seed. Let your students add miniature toy garbage trucks, front end loaders, graders, and compactors that might be used at a landfill site.

9. Have your students water or "rain" on each landfill twice weekly and observe the changes that take place. Pay particular attention to the seepage or leachate accumulation in each cake pan. The seepage from the unlined landfill can be observed as it collects in the bottom of the pan. This observable phenomenon helps children understand how ground water can be contaminated. The lined landfill should not have any seepage. Where did the "rain" water go in *this* landfill? To find out, you will have to siphon leachate out of the bottom of the clay liner using the "monitoring well." To do this, gently suck on the protruding end of the aquarium hose while keeping this end below the bottom of the clay liner. As the leachate is drawn up the hose and starts down towards your mouth, stop sucking and stick this end of the hose in the cake pan or a glass jar. This should draw off all of the leachate. Observe the leachate and discuss what you have found. Did any "toxins" show up? In modern landfills, leachates are collected and properly disposed of to prevent groundwater contamination.

10. After a period of time (several months*), open each landfill and see how many items you can find and identify. What changes have taken place? What would have happened to the leachate if it was not siphoned off or trapped in the pan?



*Several months may seem like a long time for young children to wait. Put the "opening" date on each landfill and do weekly observations. Have the class keep a "count down" to the "opening"—make it a big event.

UNDS OF NON-RECYCLABLE TRASH AT HOME, SCHOOL OR AT WORK.

GOING BEYOND

1. Place a small sample of each item that you landfilled in a jar of water. Have your students observe how water changes or doesn't change things and how things change water.
2. Once a landfill is full and officially closed, a clay "cap" is put over it to keep water out. This also effectively seals out air. What will happen to the trash if no water or air can get into the landfill? You may want to add a third colander-landfill with a clay cap to your experiment and observe what changes may take place.
3. Put examples of items made from materials used 100 years ago (wood, leather, glass, iron, etc.) and items made from modern materials (plastic, styrofoam, aluminum, etc.) in separate jars of water. Observe what happens to these items over time. How could disposing of waste in water, like oceans and lakes, affect the environment?
4. Fill a glass jar two thirds full of water, then add four drops of red food coloring. Place a stalk of celery into the water, and observe what happens. How can plants filter pollutants out of water?

Developed by Mary Snudden, Eau Claire School District, Wisconsin

FAMILY LETTER

Dear Family,

Tomorrow we will begin learning about landfills in class, and we will need examples of items that families throw away. I have asked each child to bring in five small examples of household trash.

Please help your child collect these five items from the following list:

- all types of paper items
- all types of plastic or "styrofoam"
- vegetable matter (potato peelings, carrot chunks, grass clippings, etc.)
- animal matter (chicken wing bones—only a small amount)
- broken small toys—miniature toy car pieces (metal, tires, windshields, etc.)
- aluminum foil
- other—use your imagination

Please put the items in a small plastic bag and send them to school with your student tomorrow. Thank you for your assistance.

Sincerely,

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